

3. No star, however faint its image may be on the film, is lost on the engraving, except through the carelessness of the operator. In the comparison we are now making with the photographic prints, which have been made, as already stated, with the highest practical skill on zinc plates, nearly two-thirds of the faint stars are lost on a single plate which covers a sky space of two degrees in diameter, and many others are so small that we are in some doubt if they really are stars, and it is hopeless to try to determine their magnitudes with accuracy.

The conclusion, then, to which we are led at present is, that any known system of charting the stars directly from the original negatives by the aid of photographic prints fails to meet the essential conditions in number of the stars charted—in the mensurability of their magnitudes, and in freedom from liability of printing specks as stars; whereas the proposed system of engraving meets fully each condition and leaves the original negative uninjured for future reference.

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*Photographs of the Nebulæ in the Pleiades and in Andromeda.*

By Isaac Roberts.

The accompanying photograph\* of the nebulæ in the *Pleiades* is an enlargement to four times the negative, taken on December 8, 1888, with exposure of the plate during four hours, and it brings to view all the nebulosity shown on the photographs which I have presented to the Society, and referred to at the meeting in January 1887 in a manner more clearly defined, though not exceeding the limits shown on those photographs. The nebulosity involves the following stars: *Asterope*, *Taygeta*, *Maia*, *Celæno*, *Electra*, *Alcyone*, stars 24,† 12, and far towards the *sp* of *Merope*. *Alcyone* is seen in the midst of a dense spiral nebula which branches in *np* direction towards and up to stars 9 and 8; and towards the north there are two faint circles of nebulous matter, one with its centre *np* star 15 and the other with its centre about midway between *Alcyone* and star 24. It is cut by a long nebulous streamer which extends both *p* and *f* star 24 and forms the chord of an arc. *Merope* is involved in dense streaky nebulosity, which extends far away in *sp* direction, where it fades gradually into the darkness of space. There is a crooked nebulous bridge connecting the *Merope* and *Alcyone* nebulæ, which passes over star 13. A nebulous straight line commences at star 7 and extends through star 1 in *p* direction till past the centre of *Electra*, where it ends. *Electra* has a horn-like projection from it, pointed towards *Alcyone*. *Maia* is involved in dense streaky nebulosity which extends to *Taygeta* and *Asterope* with a detached branch towards

\* The photographs are placed in the Library. † Bessel's numbers.

and involving star 12, and also a horn-like projection in the direction of star *l*. There are also streaky masses of nebulosity trending north and south, filling the space between *Maia*, *Electra*, and *Merope*. There is a remarkable absence of symmetry between these nebulae, that leads us to infer that we are looking at a number of separate nebulae one behind the other in the line of sight, and two of them, which the nebulous straight lines represent, are seen edgewise. Many stars are visible through even the densest nebulosities.

We shall henceforward be able to study these objects by aid of reliable data when verbal or written descriptions will be better understood in giving the results of generalisations.

#### *Nebula in Andromeda.*

The accompanying photograph was taken on December 29, 1888, and is enlarged to three times the negative. The exposure was during four hours, and it confirms the various details shown upon the first photograph, which was presented to the Society at the last meeting, besides bringing to sight more clearly, by reason of the longer exposure, details that were either faint or absent upon the first. I am engaged in measuring the distances and angles between certain stars and the nuclei of the three nebulae, together with the positions of some of the well-defined bright parts of the rings of the great nebula, so that in future any movement, orbital or otherwise, in their relative positions may be detected. When the measurements are completed they shall be presented to the Society.

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#### *The Surface of the Sun in 1888.* By the Rev. S. J. Perry.

A few words will suffice to tell the history of solar changes during the past twelve months. More free from spots than in any previous year of the present decade, the Sun has still shown some signs of vigour and activity. On 241 days of the year observations were secured at Stonyhurst, and out of these the surface was found to be entirely free from spots on 102 days, and even faculae were totally absent on 6 days. Throughout the year the faculae were generally scarce and faint, but, when the definition was fairly good, it seldom happened that a few scattered bright markings could not be detected, although it might sometimes require a careful search to find them. Occasionally, however, a few bright scattered faculae near the poles were the most striking feature of the Sun's surface. Comparing this year with those immediately preceding it, we find the percentage of spotless days to be greatly on the increase, having been 9.42 in 1886, 29.73 in 1887, and 42.32 in 1888. The greatest number of consecutive days during this minimum period, on which the spot-area never exceeded the one hundred thousandth part of the